p 81 # 1

possible upper/lower bound: HA, max/min

HA: $\lim_{x \to \infty} \frac{4x^2-3}{2x^2+1} = 2$

upper bound

HA $y=2$

extrema: $f'(x) = \frac{(2x^2+1)8x - (4x^2-3)4x}{(2x^2+1)^2} = 0$

$= \cancel{16x^3} + 8x - \cancel{16x^3} + 12x = 0$

$20x = 0$

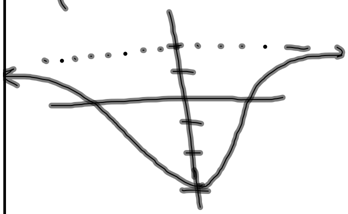
f' $\frac{20x}{(2x^2+1)^2}$

f': $-$ 0 $+$

-1 0 1

min at $x=0$

lower bound $y=-3$



Mar 4-1:06 PM

Review #3 continuity

relative growth rates

continuity:

what does this mean?

$f(x)$ is continuous on $[a,b]$

(on an interval)

$f(x)$ is continuous at every point in $[a,b]$

Mar 4-1:15 PM

$f(x)$ is continuas at $x=c$

1. $\lim\limits_{x\to c} f(x)$ exists
2. $f(c)$ exists
3. $\lim\limits_{x\to c} f(x) = f(c)$

Mar 4-1:26 PM

is $f(x) = \begin{cases} 2x-3, & x \le -1 \\ x^2-5, & x > -1 \end{cases}$ continuas

$$\lim_{x\to -1^-} 2x-3 = -5$$

$$\lim_{x\to -1^+} x^2-5 = -4$$

$$\lim_{x\to -1} f(x) = \nexists$$

because lhl $\neq$ rhl

Mar 4-1:27 PM

relative growth rates of functions

which grows faster

$f(x) = 2x$ or $g(x) = x$?

they grow at the same rate

$$\lim_{x\to\infty} \frac{f(x)}{g(x)} = L \quad 0 < L < \infty$$

$$\lim_{x\to\infty} \frac{f(x)}{g(x)} = \infty \quad f \text{ faster}$$

$$\lim_{x\to\infty} \frac{f(x)}{g(x)} = 0 \quad f \text{ slower}$$

Mar 4-1:34 PM

which grows faster x^5 or e^x ?

$$\lim_{x\to\infty} \frac{x^5}{e^x} = \lim_{x\to\infty} \frac{5x^4}{e^x} \cdots \frac{5\cdot 4\cdot x^3}{e^x}$$

$\frac{\infty}{\infty}$ $\frac{\infty}{\infty}$ $\vdots$

$$\lim_{x\to\infty} \frac{5!}{e^x} = 0$$

Mar 4-1:40 PM